

AN ANALYSIS OF THE HEALTH HAZARDS OF WORKERS IN TRANSPORT INDUSTRY

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ABSTRACT

Diesel engine emissions are a mixture of gases, vapors, liquid aerosols and substances made up of particles. They contain the products of combustion including carbon, nitrogen, water, carbon monoxide, aldehydes, oxides of nitrogen, oxides of sulphur, polycyclic aromatic hydrocarbons etc., The carbon particle content varies from 60% to 80% depending on the fuel used and the type of engine. The quantity and composition of diesel fumes in the workplace may vary depending on the quality of diesel fuel used, the type of engine, the state of engine tuning, the fuel pump setting, the workload demand on the engine, the engine temperature and maintenance of the engine. Workers exposed to high concentrations of diesel exhaust have reported the short-term health symptoms like cough, irritation of the eyes, nose and throat, light headedness, heartburn headache, weakness, numbness and tingling in extremities, chest tightness, wheezing, vomiting, etc., In the present study focused mainly on the nature of the work and the diseases related to diesel exhaust. From the study it was found out that there is a close co-relation between the nature of the work, person having other illegal behavior, non-usage of protective equipments and the respiratory problem.

KEYWORDS: Respiratory, Diesel Exhaust & Transport, Etc.,

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INTRODUCTION

Transport system has become an unavoidable possession of the civilized society. Society without advanced transport system remains primitive mobilization and migration from one place to another has become mandatory to meet the requirements of life. Hence transportation has become a common thing for immobility which is associated with poverty. It is remarkable that a nation with advanced transportation system will flourish in economy and will also promote not only business transaction but also national integration. The Indian road transportation facilities connect the mass of the interstate and intrastate and are one of the cheaper means of transportation. The well structured road transport of the nation is governed by the state transport corporations. Tamil Nadu State Transport Corporation (TNSTC) plays a significant role which connects all the villages in the state.

The importance of safety is well felt and understood by the management of any organization. Safety climate is formed by the workers' perception of the relative priority of safety versus efficiency goals [1]. The most important safety measures are adequate personal protection, careful handling of vehicles, proper training and education for safe driving and regular maintenance of the vehicle. All transport systems have diesel engine. Diesel engine are a mixture of gases, vapors, liquid aerosols and substances made up of particles. They contain the

products of combustion including carbon, nitrogen, water, carbon monoxide, Aldehydes, oxides of nitrogen, oxides of sulphur, polycyclic aromatic hydrocarbons [2-9]. The carbon particle content varies from 60% to 80% depending on the fuel used and the type of engine [10-15]. Most of the contaminants are adsorbed onto the soot. Most of the carbonaceous matter formed (80% to 98%) is oxidized during combustion, most likely by hydroxyl radicals [16]. The quantity and composition of diesel fumes in the workplace may vary depending on the quality of diesel fuel used, the type of engine, the state of engine tuning, the fuel pump setting, the workload demand on the engine, the engine temperature, maintenance of the engine. Workers exposed to high concentrations of diesel exhaust have reported the short-term health symptoms like cough, irritation of the eyes, nose and throat, light headedness, heartburn headache, weakness, numbness and tingling in extremities, chest tightness, wheezing, vomiting. Although there have been relatively few studies on the long-term health effects of diesel exhaust, the available studies indicate that diesel exhaust can be harmful to our health [17-20].

According to the National Institute for Occupational Safety and Health (NIOSH) diesel exhaust should be treated as a human carcinogen (cancer causing substance) [21]. These findings are not surprising since several substances in diesel exhaust are known to cause cancer. It may take many years after the first exposure for diesel-related cancer to develop. Exposure to diesel exhaust in combination with other cancer causing substances may increase your risk of developing lung cancer even more [22]. Other exposures that are known to cause lung cancer include cigarette smoke, welding fumes and asbestos. All of these exposures may interact with diesel exhaust to magnify your risk of lung cancer and should be kept to a minimum.

Some studies have suggested that workers exposed to diesel exhaust are more likely to have chronic respiratory problems (such as persistent cough and mucous) bronchitis and reduced lung capacity than unexposed workers. People with preexisting diseases, such as emphysema, asthma and heart disease, may be more susceptible to the effects of diesel exhaust [23]. All these studies reveal that the adverse effects of diesel are closely correlated with the respiratory problems among the workers in transport industry. Hence the present study focus mainly on the nature of the work and the diseases related to diesel exhaust.

METHODS

The data was collected from the depots of Tamil nadu State Transport Corporation of Sivagangai and Ramnad districts and the head quarters was at Karaikudi. The Karaikudi headquarter covered the several branches and are Paramakudi, Ramanathapuram, Rameswaram, Mudukulathur, Kamuthi, Karaikudi, Sivagangai, Devakottai and Thirupathur. From all these depots all different categories of the employee were selected for this study. Five Managers, forty eight Mechanics, twenty two Technical assistants and twenty five other employees in the depots were involved in the study. The sample size for this study is 100. The sampling unit for this project is non executive employees. The sampling technique applied is Stratified Random Sampling. This method is used when the population is heterogeneous, having several segments or natural sub - divisions. The primary data was collected from the employees through the personal interview. The Research Instrument used here is questionnaire contained maximum of close – ended questions. The statistical methods used in the study are Simple percentage method, Chi square test, one way ANOVA, Two ways ANOVA, H-test, Sign test, U Test, and Correlation (KARL PEARSON) coefficient. The aim of the present study includes collection of the primary data from the employers of the transport depot from Paramakudi, Muthukulathur, Ramanathapuram, Karaikudi, Devakottai and Kumuthi, analyzing the collected primary data statistically and providing suitable suggestions to minimize the health hazards due to diesel exhaust.

RESULTS AND DISCUSSIONS

The primary were collected from the employee of different sub division of TNSTC-Karaikudi division and were analyzed statistically about 100 employees responded to the questionnaire given to them. The simple percentage method was used for the following analysis.

The relationship between designation and respiratory problem was analyzed and from the study it was inferred that the respondent in the mechanical work (48%) had more respiratory problems.

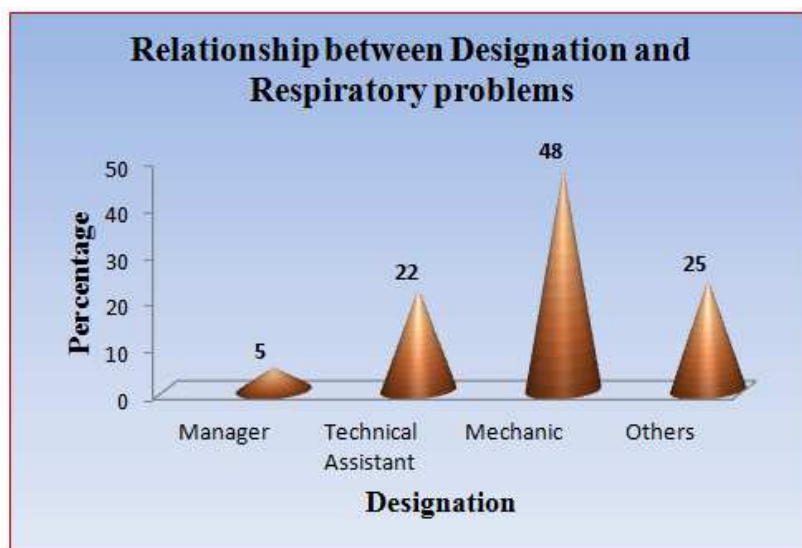


Figure 1: Relationship between Designation and Respiratory Problems

The age and nature of work play an important role for the causes of respiratory problems. The age level of respondents varies from 25 to 58. The analysis from the collected data shows that persons between 55-58 ages were affected with more respiratory problems. The respiratory problem caused by the diesel exhaust was found to be higher for persons involved in diesel and motor mechanic when compared to others. The analysis shows that 43% of the respondents are working in diesel and motor mechanic and 15% of the respondents are working in mechanic. The experience level of respondents varies from 2 years to above 15 years. The experience plays an important role for the causes of respiratory problems. The analysis from the collected data shows that the more respiratory problems were met by the persons with more than 15 years of experience. The analysis shows that 48% of the respondents were above 15 years experience. The workers who are working more than 12 hours met with more number of respiratory problems. The analysis shows that 30% of the respondents are working 12 hours and 22% of the respondents are working 8 hours. The study was focused with the persons having other habits. The analysis shows that the persons having snuff habits met with only 10% of respiratory problem, persons having smoking habit met with 43% of respiratory problem and persons having alcoholic habit met with 5% respiratory problem. Smoking leads to more respiratory problems than others.

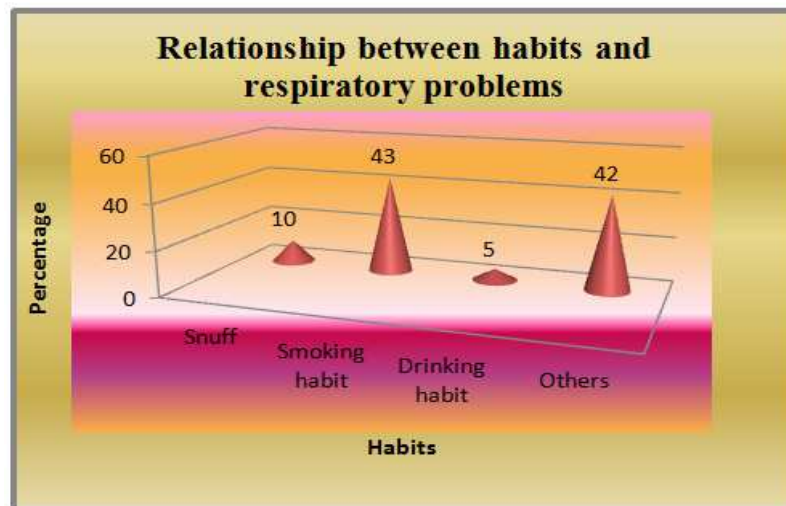


Figure 2: Relationship between Habits and Respiratory Problems

The existence of cough and wheezing before and after joining the job was studied. The analysis shows that the less number of respondents have cough before joining the job and it was observed that only 32% of the respondents have cough problem before joining the work. After joining the job 52% of the respondents have cough problem that and was nearly 20% higher. Only 9% of respondents have wheezing problem before joining the work and 94% of the respondents have no wheezing problem before joining the work. Large number of respondents (55%) has wheezing problem after joining the work. From the analysis it was observed that nearly 45% of the respondents have wheezing problem after joining the work.

The statistical analysis from primary data was carried out to find out the relationship between the causes and effects due to diesel exhaust. The cross tabulation method was used to study the relationship between wearing protective equipment like respirator and cough. The hypothesis framed was:

H₀: There is no relationship between wearing protective equipment like respirator and cough occurs after joining the work.

The Chi-Square Test was carried out to find out the relationship and the Chi Square Value obtained is 6.81 (Degrees of Freedom = 1). The χ^2 value is greater than the table value (3.841) and hence the null hypothesis H₀ was rejected. Therefore it was concluded that there is a relationship between wearing PPE like respirator and cough after joining the work.

The sign test was used to compare the respiratory problem after joining the work and before joining the work. The hypothesis framed was:

H₀: There is no significant difference between respiratory problem after joining the work and before joining the work.

Table 1: Respiratory Problem after Joining the Work and before Joining the Work

Type of Problems (Both Short Term & Long Term Diseases)	Respiratory Problems after Joining the Work	Respiratory Problems Before Joining the Work	Sign
Cough	52	32	+
Wheezing	55	6	+

Table 1: Contd.,			
Eye discomfort	52	13	+
Nose irritating	95	50	+
Emphysema	48	40	+
Asthma	32	30	+
Heart attack	6	8	-
Lung cancer	2	1	+
tuberculosis	12	13	-

The K value was calculated:

$$K=(n-1)-(0.98) \sqrt{n}$$

$$K=(9-1)-(0.98) \sqrt{9}$$

$$K=5.06$$

Total number of (+) sign=7 Total number of (–) sign=2, n=9, S=2, Since S<K the hypothesis was rejected. Hence there is significant difference between respiratory problems after joining the work and before joining the work.

Karl Pearsons coefficient of correlation (assumed mean method) was used to study the correlation between wearing personnel protective equipment (PPE) and short term and long term respiratory problems. The hypothesis framed was:

H₀: There is no significant difference between wearing personnel protective equipment and short term and long term respiratory problems

Table 2: Correlation between Wearing Personnel Protective Equipment (PPE) and Short Term and Long Term Respiratory Problems

X(Respiratory Problems)	Y(Wearing PPE)	X ²	Y ²	XY
12	52	144	2,704	624
35	55	7,225	3,025	4,675
90	95	8,100	9,025	8,550
98	52	9,604	2,704	5,096
87	48	7,569	2,304	4,176
14	32	196	1,024	448
76	6	5,776	36	456
88	14	7,744	196	1232
Σx = 500	Σy = 354	Σx²=46,358	Σy²=21,018	Σxy = 25,257

The correlation coefficient was calculated as follows:

$$\begin{aligned}
 r &= \frac{N\Sigma xy - \Sigma(x)\Sigma(y) - \Sigma(x)\Sigma(y)}{\sqrt{N\Sigma x^2 - (\Sigma x)^2} * \sqrt{N\Sigma y^2 - (\Sigma y)^2}} \\
 &= \frac{8(25,257) - (550)(354)}{\sqrt{8 * 46,358 - (550)^2} * \sqrt{8 * 21,018 - (354)^2}} \\
 &= \frac{7,356}{\sqrt{68,364} * \sqrt{42,828}} \\
 &= \frac{7,356}{5,41,09,135} = 0.135
 \end{aligned}$$

It was inferred that the correlation between wearing PPE and respiratory problems has low degree of positive correlation. Hence there is smaller relation between wearing personnel protective equipment and respiratory problems.

The correlation between workers habit and type of respiratory problem was studied using actual mean method. The calculated Correlation coefficient = $\Sigma_{xy} / \sqrt{\Sigma x^2 + \Sigma y^2}$, = 0.323. Hence It was concluded that there is moderate degree of positive correlation. It was inferred that when the habit of employee (Snuff, Smoking habit, Drinking habit, etc.,) increases then the respiratory problems also increases moderately.

CONCLUSIONS

Transport Industry workers exposed to diesel exhaust are more likely to have chronic respiratory problems (such as persistent cough and mucous) bronchitis and reduced lung capacity than unexposed workers. All these studies reveal that the adverse effects of diesel are closely correlated with the respiratory problems among the workers in transport industry. Diesel exhaust does contribute to air pollution and may be partly responsible for the health effects generally associated with air pollution. If new regulations and technology to reduce Diesel Engine Emissions are fully implemented the health risk of employee in transport industry who are completely exposed to the diesel exhaust will be minimized.

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